range of temperature is at the maximum. The expansion of the air from the increase of temperature during the day raises its mass to a higher level, thus maintaining the barometer at a higher point during the time of the afternoon minimum.

The maximum velocity of the wind occurs during the night, and the minimum during the day, in all months of the year. This peculiarity in the diurnal variation, being just the reverse of what obtains at low levels, is explained by the circumstance that during the night cold currents of air descend the slopes of the mountain on all hands, and the air currents from higher levels which take their place bring with them their higher velocities. On the other hand, during the day, air currents ascend the slopes of the mountain, carrying with them to the summit their velocities diminished from various causes during the ascent. One effect of these ascending currents carrying with them the higher humidities of lower levels, is illustrated by the partition during the day of the sunshine. Thus, in the nine months of spring, summer, and autumn, there are 306 hours of sunshine before noon, but only 285 hours after it.

The concluding portion of the report deals with the miscellaneous discussions and investigations on the formation of snow crystals, winds and rainfall, diurnal variation of wind direction, the thermal wind-rose, rain-band observations, St. Elmo's fire, thunderstorms, mean temperature of each day in year, hygrometry, optical phenomena, and earth currents in the telegraph cable; but as the results of these have from time to time appeared in NATURE, further reference to them is unnecessary.

We would draw special attention to the Observatory log-book, pp. 316–56, which is a remarkably readable, as well as an instructive, document. The following extract presents an interesting side of the Observatory work in this isolated and exposed situation:—

"*January* 26, 1884.—In forenoon wind backed from south to south-east and blew hard. As the drift made it impossible to read thermometer at 1 p.m., Mr. Omond and Mr. Rankin went out tied together, but found it impossible to go farther than the end of the snow porch with safety; at 4 p.m. they got as far as the box, but could not see instruments as the drift blew up in their faces. No temperature observations were taken till 10 p.m., when wind moderated and observations were resumed. There was thus a gap in the temperature observations from noon to 9 p.m. inclusive. Quarter and half hourly barometer observations were taken in afternoon. Lowest recorder reading (corrected to 32°) 23·173 inches."

Optical phenomena, including after-glows, halos, mock suns, mock moons, glories, &c., have been fully observed, and the results are in many respects of the greatest interest. The following graphic account of St. Elmo's fire will be read with interest:—

"*October* 29, 1887.—At 1h. 5m. a.m. St. Elmo's fire was seen in jets 3 to 4 inches long on every point on the top of the tower and on the top of the kitchen chimney. Owing to the number of jets on each cup of anemometer, the instrument was quite ablaze. On the kitchen chimney the jets on the top of the cowl were vertical, and those on the lower edge of same horizontal. The fizzing noise from the different places was very distinct. While standing on office roof watching the display, the observer felt an electric sensation at his temples, and the second assistant observed that his (the observer's) hair was glowing. While standing erect the sensation and glow lasted, but on bending down they always passed off. On raising the snow-axe a little above his head, a jet 2 to 3 inches long shot out at the top. At 1h. 15m. a.m. the fire vanished from every place at the same instant. A shower of snow and snow-hail (conical) was falling at the time, and the wind was variable south to south-west breeze—very flawy."

THE PHOTOGRAPHIC CHART OF THE HEAVENS.

THE Permanent International Committee for the prosecution of the photographic chart of the heavens, has met, deliberated, and adjourned. It will be generally admitted, when the result of their discussions has been digested, that the promise of much good work has been given, and the accomplishment of a photographic chart been brought nearer within the scope of practical astronomy. At a future opportunity we hope to give in some little detail an outline of the arguments that have succeeded in causing deviations from the plan originally contemplated. Now, we can only give a brief account of the report of Admiral Mouchez, and a summary of the more important results which have received the support of the Committee.

Admiral Mouchez's report may be considered as divided into three parts: first, that relating to the installation of the photographic instruments; second, to the methods and apparatus necessary for the measurement of the negatives; and third, the manufacture and employment of *réseaux*. From the first of these sections we learn that all the participating Observatories are provided with satisfactory telescopes; but, unfortunately, the grave political events which have disturbed the Chilian Government are likely to operate adversely on the scientific advance of that country, and the station at Santiago may possibly have to be abandoned, M. Maturana, the Chilian astronomer, having received orders to report himself to his Government for military service. Some delay has been occasioned at Rio de Janeiro by the removal of the Observatory to a distance of six or eight kilometres, where, under more favourable atmospheric conditions, the photographic equatorial is being erected. With these exceptions, the Observatories declare themselves all ready for work.

With regard to the second section, we learn that the construction of the measuring instrument, generously offered by M. Bischoffsheim, has been delayed, owing to difficulties of correspondence between MM. Gill and Kapteyn; but now that these gentlemen have had an opportunity of deciding the particular form the instrument should take, it will be rapidly proceeded with, and it is believed that the employment of such an instrument will greatly abridge the difficulties of measurement and calculation.

The manufacture of the *reseaux* has been definitely abandoned by the authorities at Berlin, but M. Gautier has constructed an instrument for the ruling of these necessary adjuncts, and he is now in a position to supply those Observatories which have failed to obtain *réseaux* from M. Vogel.

Three important points have been before the Committee, and it has been found necessary on these points to modify the decisions of previous Committees. The first of these referred to the desirability of obtaining on the plates of shorter exposure, destined to form a catalogue, impressions of star images with one-fourth of the exposure found necessary to secure the impression of an eleventh magnitude star. The result of this decision would have been to give a picture of the heavens obtained with an exposure of a minute and a half, or a minute, or even less. This project has now been abandoned in favour of one arranged to give impressions, very feeble in character, of stars of the eleventh magnitude, while on the same plate will be exhibited a picture of the heavens obtained with an exposure of twice the length necessary for producing star images in the former case. Thus we may expect on these catalogue plates, exposures of three to four minutes, and also of six to eight minutes.

Another interesting point, over which excitement waxed keen, arose on a proposal of M. Henry to substitute three exposures of equal length, arranged at the

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angles of an equilateral triangle whose sides are about 5″, instead of one exposure of three times the length. It was asserted that a photograph obtained in this manner, in which each of the exposures was continued for twenty minutes, would exhibit more stars than a photograph with a single exposure of one hour. It was eventually decided that the chart plates taken at the even degrees should have a single exposure, while the exposures of the plates taken at the odd degrees should be left to the discretion of the observers.

The third and last point to which reference may be made here is the length of time to be generally devoted to securing a plate for the chart. It was generally felt that, if the exposures were made long enough to secure the impressions of a fourteenth magnitude star, as generally understood in photometric work, the length of time required would entail too great a strain upon the capacity of the observer. It has therefore been recommended by a sub-committee to confine the exposures to about forty minutes, which, it is believed, will be about eight or ten times the exposure required to impress the image of an eleventh magnitude star on plates as at present employed, and under the ordinary meteorological conditions of the Paris Observatory.

CRYSTALS OF PLATINUM AND PALLADIUM.

I HAVE found that crystals of the metals platinum and palladium are easily prepared as follows :—

A ribbon of the pure metal is stretched horizontally between two binding screws. Upon the ribbon, some topaz, reduced to a fine powder, is dusted. A current is now passed through the ribbon, of a strength sufficient to raise it to a bright red heat. In about half an hour's time, if the current be stopped and the ribbon examined with a microscope, it will be found that very small brilliant crystals cling here and there to projecting points on the partially decomposed topaz. If the heat be maintained, these crystals steadily grow ; in about two hours some will have attained to a size of about 0·1 mm.

Platinum was the first substance which I crystallized in this manner. When the topaz was scraped off the ribbon, the under surface of the caked fragments was found covered with a grey deposit of the small crystals. Under the microscope, using a 1-inch objective, these present a very brilliant appearance. They are opaque, and show a high metallic lustre, like that of clean mercury, but are somewhat whiter in colour. The faces are clean, and sharply defined. Their crystallographic system is very evidently cubic. The prevailing form is the octahedron, or some modification of it. When the octahedron is perfect, the triangular faces are equilateral. Strings of octahedra occur, after the manner of magnetite. A common modification of the octahedron is that well known in the case of alum, in which two opposite faces of the solid are dominant, giving a tabular form. Very thin hexagonal tables also occur, suggesting, at first sight, dimorphism. These, in the opinion of Prof. Sollas, might be referred to an extreme development of the alum habit. Many observations support this view, which seems preferable to supposing dimorphism.

Hemihedral forms occur, principally the tetrahedron and modifications of it. The combination of tetrahedron and cube, the tetrahedron being dominant, is observed. Acicular forms are also present, but are scarce. The following observations bear upon the nature of these crystals.

Treated in hot hydrochloric, sulphuric, or nitric acid, they are unattacked. They also appear unaffected in cold hydrofluoric acid. In hot hydrofluoric acid they seem slightly attacked. They are slowly but completely dissolved in boiling aqua regia, from which a precipitate of ammonium platinic-chloride is obtained on the addition of ammonium chloride. They are not attracted by the electro-magnet, and conduct electricity (shown by touching the opposite extremities of a crystal with fine needles in circuit with a battery and galvanometer). When crushed between two glass slips they spread out, giving the glass the appearance of a mirror. Although in this way much extended, they show no appearance of cracking upon the edge. They are therefore very malleable. Their melting-point approximates to that of platinum, for a ribbon with some of these crystals clinging to it may be raised to its melting-point, when some of the crystals will be found partially fused. The ribbon upon which crystals have been formed presents a roughened appearance.

The bodies present at their formation are platinum, fluorine, silica, alumina, and a trace of iron. From the physical characters observed, however, the crystals are certainly metallic, and in fact can only be platinum, probably in a very pure state. It would appear that fluorine, liberated at a high temperature from the topaz, attacks the platinum, forming a fluoride, which again breaks up, depositing the crystals.

M. Moissan has already observed that the tetrafluoride of platinum when reduced leaves distinct crystals of the metal (NATURE, vol. xli. p. 118). M. Moissan obtained the fluoride by the direct action of dry fluorine on platinum at a low red heat, and mentions that this body splits up again at a higher temperature. The position of the greater part of the crystals in the present experiment, close to the surface of the platinum, is in agreement with the instability of the fluoride at a high temperature. It seems necessary to suppose the formation of the fluoride to occur further away from the ribbon where the temperature is suitable. So that it appears that a considerable volatilization of the platinum takes place. It is remarkable that, if the conditions are such that the temperature throughout the mass of the mineral is uniform, the crystals of platinum are not formed. Thus, if powdered topaz is rolled up tightly in a tube of platinum, and this tube heated for a considerable time by the passage of a strong current, the mineral is decomposed, there is considerable loss of weight, but no platinum crystals are formed. On the other hand, acicular crystals, which are colourless and transparent, are found under these conditions plentifully intermixed through the partially fused *débris*.

It appeared probable that some related metals might afford crystals in the same manner. Palladium and iridium suggested themselves. The latter I have not yet been successful with, owing to the difficulty of obtaining a piece of suitable dimensions. Palladium ribbon was easily obtained, Messrs. Johnson, Matthey, and Co. supplying this and the other pure metals.

The ribbon of palladium was treated in the same manner as the platinum. Crystals were easily formed.

These are very similar in colour and lustre to the crystals of platinum. In form they appear isomorphous ; I have not been able to detect any difference, so that the foregoing remarks on the form of the platinum crystals apply to these also. It seems reasonable to suppose that a tetrafluoride of palladium is concerned in their formation. J. JOLY.

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DR. NANSEN ON GLACIATION.

IT may be worth while to call attention to one or two points of scientific interest in connection with the results obtained by the heroic band of Norwegians, whom Dr. Nansen led across Greenland, as set forth by the chief of the expedition in the appendix to the "First Crossing of Greenland" (Longmans, 1890).

(1) The importance of the internal heat of the earth and its conductive transmission to the contact-plane, as a factor in the mechanics of glaciers, for which I contended eight years ago, may be said to be now established. The

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